To: Cheryl, CZY for Director's Corner

Raytheon, WAAS Big Winners in 2001 Radionavigation Plan

Raytheon (RTN), prime contractor for the wide area augmentation system (WAAS) program and a powerhouse in military avionics and anti-jam systems, emerged as a big winner in the **Department of Transportation's** (DOT) 2001 Federal Radionavigation Plan (FRP), released last week. WAAS is a geographically expansive augmentation to the basic satellite-based Global Positioning System (GPS) navigation service.

The aerospace and defense firm has a lock on taking WAAS through initial operating capability certification for safety-of-life applications, expected to occur during the first half of 2003. Thereafter, any domestic or international receiver or avionics manufacturer could produce WAAS user equipment, so long as it meets **Federal Aviation Administration** (FAA) certification specifications and regulations.

Total industry sales for all WAAS-related hardware and systems, combined with expected sales of local area augmentation system (LAAS)-related hardware and systems, could "readily" exceed $1 billion over a few years, said Mike Shaw, chief of the DOT's Radionavigation Office. There will be "substantial opportunities" for mid-size and smaller vendors, he added, as a direct result of the 2001 FRP.

"It's clearly in the best interests of all of us that the companies that build certified equipment are not just a few of the high-end **Boeings** [BA], **Raytheons** [RTN], or **Honeywells** [HON]," Shaw said. "It has to be more than just one or two high-end vendors competing," although there are some economies of scale, he said.

John Britigan, director of satellite navigation for Raytheon's C-3I (command, control, communications, and information) unit, declined to put a price tag on the size of the "very robust" WAAS opportunity. But he said that the system already has well over 200,000 users—even before safety-of-life certification—which along with industry sales "will go up exponentially" once that milestone is achieved.

Commercial-grade WAAS receivers are now being used in the maritime industry, in precision agriculture, in crop dusting, and in some recreational uses, Britigan noted. In addition, over 100,000 consumer-grade units are in the hands (or on the pleasure boats) of ordinary Americans.

The report did not mention the chief rival to WAAS, Boeing's comprehensive, satellite-based air traffic management (ATM) plan, which also includes communications and surveillance functions. Shaw suggested that the FRP is essentially "good news" for Boeing, insofar as it calls for the aggressive phase-in of satellite-based navigation solutions, and the gradual phase-out of almost all ground-based solutions beginning in 2010.

Steve Fisher, deputy program manager for Boeing's GPS program office, said the FRP was "neutral" regarding Boeing's ambitious ATM plans. "Our ATM system is planned as an overlay to, and not a replacement for, anything the FAA may field," he said.

Proponents of ground-based navigation solutions, especially Loran-C, are likely to be disappointed in the FRP's implications for them. The document leaves the future of Loran up in the air, and no definite federal guidance is expected until the release of the 2003 FRP, Shaw said.

The reliability and integrity of GPS, and its WAAS and LAAS derivatives, are foremost in the minds of private industry, as well as in the minds of Shaw and his colleagues. Senior executives within Boeing, builder of the Block II-F satellites, and within **Lockheed Martin** [LMT], builder of the Block II-R birds, all said that they believe the best solutions to intentional and unintentional interference should be built into the satellite systems themselves. The upcoming addition of second and third civil GPS signals will greatly enhance signal interference mitigation, they said.

But a determined military foe or terrorist could jam even two or three civil signals, a fact that government and industry are well aware of.

"Everything we have done has been reassessed, and will continue to be reassessed, in the wake of Sept. 11," Shaw said. Access to a variety of back-up systems, and communication with the control tower in the case of aircraft, will be key, he added. Homeland defense issues have been "folded into" the 2001 FRP and there is an ongoing counter-terrorism study, Shaw said. "We will now be very careful in not phasing out the alternative systems too early and too quickly to ensure that we have accounted for the terrorist threat," he said.

In the interim before 2010, those alternative systems—plus ongoing enhancements to the GPS constellation—could still be worth big bucks. Boeing and Lockheed Martin executives estimate that enhancements to GPS satellites, ground infrastructure and commercial aircraft will generate hundreds of millions of dollars in revenues for their companies.

The FRP devotes several paragraphs to GPS signal jamming. Makers of anti-jamming gear such as Lockheed Martin (on the military side), and Raytheon and **Electro Radiation** [ERI] (on the military and commercial sides) could be big beneficiaries. Shaw confirmed that as anti-jam technology evolves and declines in price, it's possible that the DOT will mandate its use aboard the various modes of transportation. Britigan said he expects user demand from airlines will drive anti-jam technology sales with or without DOT mandates. ERI CEO Mario Casabona said that he doesn't expect commercial avionics-makers or airlines to jump on board unless they are compelled to do so by federal certification standards.

Raytheon plans to continue to be proactive in recommending interference mitigation technology both to the government and to the user community, including trade associations, Britigan said. Honeywell, a leading supplier of commercial avionics, will await further governmental guidance before committing more research and development dollars to anti-jam and/or non-GPS-dependent technology, said a Honeywell executive.

—Peter Warner